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GRAPHICAL SYMBOLS USED IN ELECTROTECHNOLOGY

PART IX ELECTRON TUBES (OTHER THAN MICROWAVE TUBES)

Second Reprint AUGUST 1982
(Incorporating Amendment No. 1)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Rs 7·00

July 1969

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GRAPHICAL SYMBOLS USED IN ELECTROTECHNOLOGY

PART IX ELECTRON TUBES (OTHER THAN MICROWAVE TUBES)

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(*Continued on page* 2)

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GRAPHICAL SYMBOLS USED IN ELECTROTECHNOLOGY

PART IX ELECTRON TUBES (OTHER THAN MICROWAVE TUBES)

0. FOREWORD

0.1 This Indian Standard (Part IX) was adopted by the Indian Standards Institution on 3 April 1969, after the draft finalized by the Electrotechnical Standards Sectional Committee in consultation with the Electron Tubes and Valves Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard covers graphical symbols for electron tubes other than microwave tubes. Graphical symbols for microwave tubes may be covered by a separate standard in due course.

0.3 It is common in electrical and electronic engineering practice to employ graphical symbols to denote the various means and devices used when making diagrams of connections. The connecting devices and the points where they make contact with the apparatus may be indicated in the diagram. With the object of standardizing the symbols to meet the various needs of the electrical and electronic industry based, as far as possible, on symbols internationally agreed, a series of standards is being formulated.

0.4 In selecting and devising these symbols the object has been to ensure, as far as possible, that they are self-explanatory, easy to draw and in general use. It may be necessary in detailed diagrams to indicate the physical structure of the apparatus, the actual position of the terminals and so forth, but, where possible, the principle of the standard symbols should be followed.

0.5 It may be possible that for the items specified in this standard other symbols are used in this country. However, in the interest of the unification in the use of these symbols, only one symbol based on the internationally agreed symbols for each of the devices has been specified.

0.6 While preparing this standard, assistance has been derived from IEC Publication 117-6 ‘ Recommended graphical symbols, Part 6 : Variability, examples of resistors, elements of electronic tubes, valves and rectifiers ’, and Amendment No. 1 to IEC Publication 117-6, issued by International Electrotechnical Commission.

0.7 This standard is one of a series of Indian Standards for graphical symbols used in electrotechnology. A list of standards so far published in this series is given on page 16.

1. SCOPE

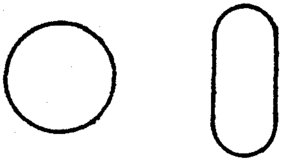
1.1 This standard (Part IX) covers graphical symbols for electron tubes other than microwave tubes.

2. ENVELOPES

2.1 Envelope

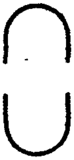
2.1.1 *General Symbol*

NOTE — This applies also to a vacuum envelope.

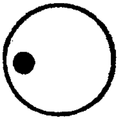


2.1.2 *Split Envelope*

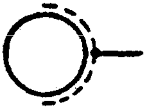
NOTE — If necessary, the envelope symbols may be split in the case of multiple devices within the same envelope.



2.1.3 *Envelope Containing Gas or Vapour*

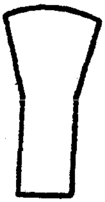


2.1.4 *Envelope with External Screen*

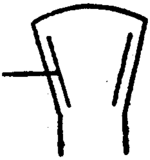


2.1.5 *Special Envelopes*

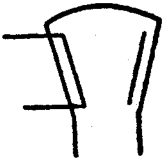
2.1.5.1 *General symbol*



2.1.5.2 *Envelope with internal conductive coating*

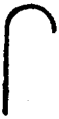


2.1.5.3 *Envelope with internal conductive coating with graded potential*

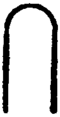


3. CATHODES

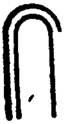
3.1 Hot Cathode (General Symbol)



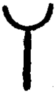
3.2 Directly Heated Cathode or Heater for Indirectly Heated Cathode



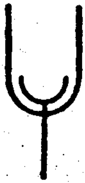
3.3 Indirectly Heated Cathode with Associated Heater



3.4 Photoelectric Cathode

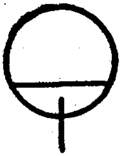


3.4.1 *Photoelectric Cathode (Envelope Partially Represented)*

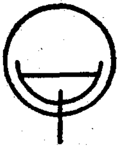


3.5 Pool Cathode

3.5.1 *Pool Cathode not Insulated from the Envelope, Shown with the Envelope*

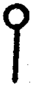


3.5.2 *Pool Cathode, Insulated and Shown with the Envelope*

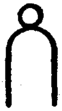


3.6 Cold Cathode

3.6.1 *Cold Cathode, Including Ionically Heated Cathode*

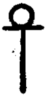


3.6.2 *Cold Cathode, Including Ionically Heated Cathode, with Supplementary Heating*

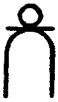


4. COMPOSITE ELECTRODES

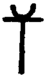
4.1 Composite Electrodes Serving Alternately as an Anode and as a Cold Cathode (Including Ionically Heated Cathode)



4.2 Composite Electrodes Serving Alternately as an Anode and as a Cold Cathode (Including Ionically Heated Cathode) with Supplementary Heating

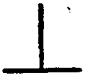


4.3 Composite Electrodes Serving Alternately as an Anode and a Photo-Cathode

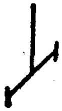


5. ANODES

5.1 Anode (Plate) or Collector

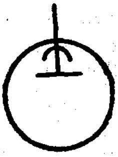


5.2 Fluorescent Target

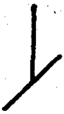


Note — The symbol specified in 5.1 may be used if there is no risk of confusion.

5.3 Anode with Secondary Emission, Dynode, Shown with an Envelope

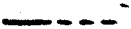


5.4 X-ray Tube Anode

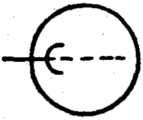


6. GRIDS, DEFLECTING ELECTRODES, FOCUSING ELECTRODES AND MISCELLANEOUS ELECTRODES

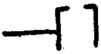
6.1 Grid



6.2 Grid with Secondary Emission, Dynode, Shown with an Envelope

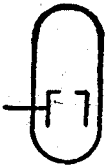


6.3 Intensity Modulating Electrode

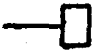


Note — If simplification is desired, the symbol specified in 6.1 may be used.

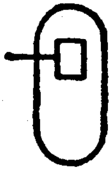
6.3.1 *Intensity Modulating Electrode, Shown with an Envelope*



6.4 Cylindrical Focusing Electrode or Drift Space Electrode or Electronic Lens Element

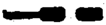


6.4.1 *Cylindrical Focusing Electrode or Drift Space Electrode or Electronic Lens Element Shown with an Envelope*

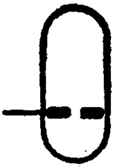


6.5 Focusing Electrode with Aperture or Beam Forming Plate

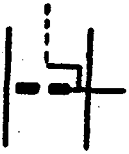
NOTE — If simplification is desired, the symbol specified in **6.1** may be used.



6.5.1 *Focusing Electrode with Aperture or Beam Forming Plate Shown with an Envelope*

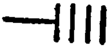


6.5.2 *Beam Splitting Electrode, Internally Connected to the Final Focusing Electrode of an Electron Gun*

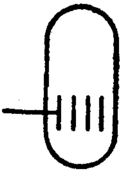


6.6 Multi-Aperture Electrode

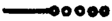
NOTE — If simplification is desired, the symbol specified in **6.1** may be used.



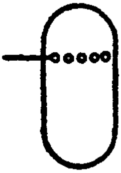
6.6.1 *Multi-Aperture Electrode, Shown with an Envelope*



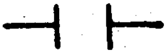
6.7 Quantizing or Sampling Electrode



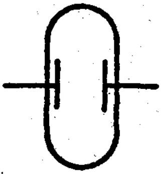
6.7.1 *Quantizing or Sampling Electrode, Shown with an Envelope*



6.8 Pair of Lateral Deflecting Electrodes

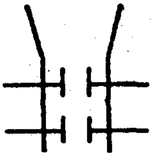


6.8.1 *Pair of Lateral Deflecting Electrodes, Shown with an Envelope*

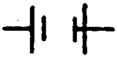


6.8.2 *Electrostatic Deflection System*

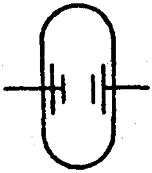
NOTE — The pairs of deflecting plates may be labelled, for example, *x* horizontal and *y* vertical.



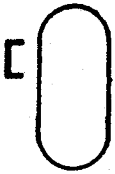
6.9 Pair of Radial Deflecting Electrodes



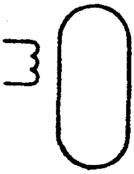
6.9.1 *Pair of Radial Deflecting Electrodes, Shown with an Envelope*



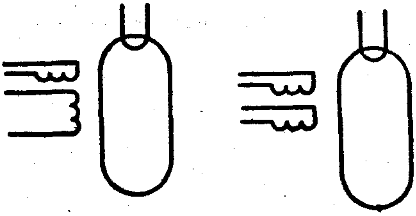
6.10 Permanent Magnet Device used for Focusing or Centering or as an Ion Trap, Shown with an Envelope



6.11 Electromagnetic Focusing Device, Shown with an Envelope

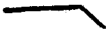


6.12 Coil for Electromagnetic Deflection, Shown with an Envelope

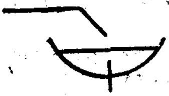


7. IGNITING ELECTRODES

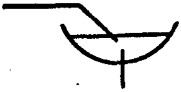
7.1 Trigger Electrode or Igniting Electrode



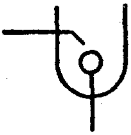
7.2 Pool Cathode with Igniting Electrode



7.3 Igniter Shown Dipping into a Pool Cathode

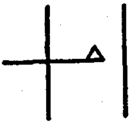


7.4 Trigger Tube with a Cold Cathode

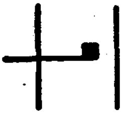


8. ELEMENTS OF TELEVISION CAMERA TUBES

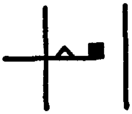
8.1 Photo-Emissive Electrode



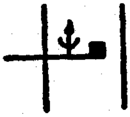
8.2 Storage Electrode



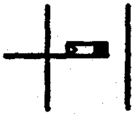
8.3 Photo-Emissive Storage Electrode



8.4 Storage Electrode with Secondary Emission in the Direction of the Arrow

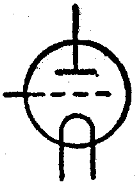


8.5 Photo-Conductive Storage Electrode

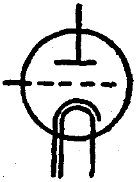


9. EXAMPLES OF ELECTRONIC TUBES

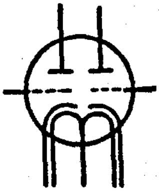
9.1 Triode, with Directly Heated Cathode



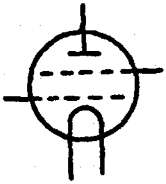
9.2 Triode, with Indirectly Heated Cathode



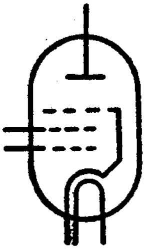
9.3 Double Triode, with Indirectly Heated Cathode and with Centre-Tapped Heater



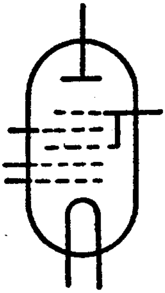
9.4 Tetrode, with Directly Heated Cathode



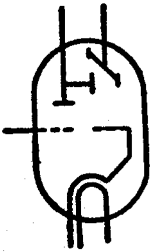
9.5 Pentode, with Indirectly Heated Cathode and Internal Strap Between Suppressor-Grid and Cathode



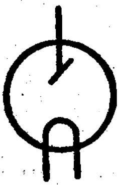
9.6 Heptode, with Directly Heated Cathode



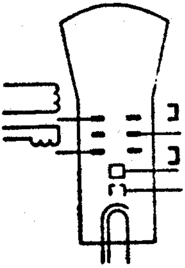
9.7 Tuning Indicator (Magic Eye) with Indirectly Heated Cathode



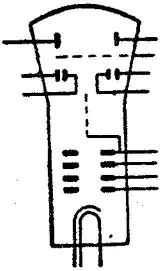
9.8 X-ray Tube, with Directly Heated Cathode



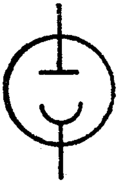
9.9 Television Picture Tube — Cathode ray tube, with electro-magnetic deflection, permanent magnet focusing and ion trap, with intensity modulating electrode, with indirectly heated cathode.



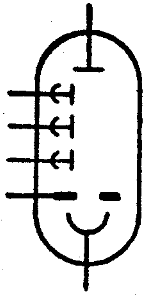
9.10 Double Beam Cathode Ray Tube (Split-Beam Type) with Electrostatic Deflection and Indirectly Heated Cathode



9.11 Photo-Tube

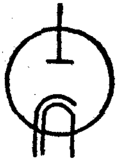


9.12 Photo-Multiplier with Three Dynode Stages

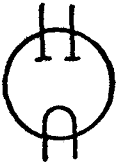


10. EXAMPLES OF VALVES AND RECTIFIERS

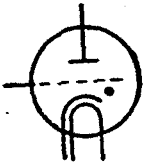
10.1 Single-Anode Rectifying Valve (Diode), with Indirectly Heated Cathode



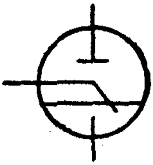
10.2 Double-Anode Rectifying Valve, with Directly Heated Cathode



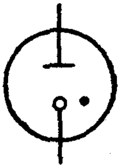
10.3 Thyratron — Gas-filled triode with indirectly heated cathode.



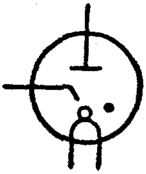
10.4 Ignitron



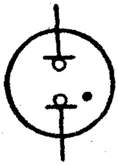
10.5 Cold-Cathode Tube, Gas-Filled (Voltage Stabilizer)



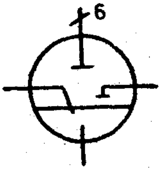
10.6 Trigger Tube with Ionically Heated Cathode and Supplementary Heating

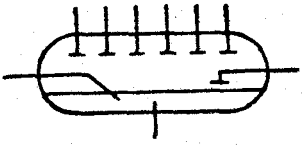


10.7 Cold-Cathode Gas-Filled Tube, Symmetrical (Neon Indicator)



10.8 Rectifier with Six Main Anodes and with an Igniter and Excitation Anode





INDIAN STANDARDS
ON
ELECTRON TUBES

IS:

1885 Electrotechnical vocabulary:
- (Part IV/Sec 1)-1973 Part IV Electron tubes, Section 1 Common terms (*first revision*)
- (Part IV/Sec 2)-1973 Part IV Electron tubes, Section 2 X-ray tubes (*first revision*)
- (Part IV/Sec 3)-1970 Part IV Electron tubes, Section 3 Microwave tubes
- (Part IV/Sec 4)-1970 Part IV Electron tubes, Section 4 Cathode ray tubes
- (Part IV/Sec 5)-1972 Part IV Electron tubes, Section 5 Pulse terms
- (Part IV/Sec 6)-1972 Part IV Electron tubes, Section 6 Noise in microwave tubes
- (Part IV/Sec 7)-1973 Part IV Electron tubes, Section 7 Camera tubes
- (Part IV/Sec 8)-1973 Part IV Electron tubes, Section 8 Photosensitive devices

2032 Graphical symbols used in electrotechnology:
- (Part IX)-1969 Part IX Electron tubes (other than microwave tubes)
- (Part XIII)-1971 Part XIII Microwave tubes

2597 Code of practice for the use of electron tubes:
- (Part I)-1964 Part I Commercial receiving tubes
- (Part II)-1967 Part II Special quality receiving tubes
- (Part III)-1969 Part III Transmitting and industrial tubes
- (Part IV)-1970 Part IV Cathode ray tubes
- (Part V)-1971 Part V Rectifiers and thyratrons

2612-1965 Recommendation for type approval and sampling procedures for electronic components

2684 Dimensions of electron tubes:
- (Part I)-1972 Part I Miniature '9-pin noval' type (*first revision*)
- (Part II)-1972 Part II Miniature '7-pin' type (*first revision*)
- (Part III)-1971 Part III Octal base type
- (Part IV)-1971 Part IV Magnoval base type
- (Part V)-1972 Part V Loctal base type

3154-1965 Specification for X-ray tubes, diagnostic type
4096-1973 Method of measurement of optical focal spot size of X-ray tubes (*first revision*)
4147-1967 Method of measurements on conventional receiving electron tubes
4579-1968 Method of measurements on television picture tubes
4697-1968 Method of measurements on Geiger Muller counter tubes
5323-1969 Letter symbols and abbreviations for electron tubes
5627-1970 Methods of measurements on cathode-ray display tubes

5840 Dimensions of cathode-ray tubes:
- (Part I)-1970 Part I Tube outlines
- (Part II)-1970 Part II Bases
- (Part III)-1970 Part III EHT terminals

6134 Methods of measurement on microwave tubes:
- (Part I/Sec 1)-1971 Part I General measurements, Section 1 General conditions and precaution for measurements
- (Part I/Sec 2)-1972 Part I General measurements, Section 2 Common to all devices
- (Part II)-1973 Part II Oscilator tubes
- (Part III)-1973 Part III Amplifier tubes

6136-1971 Basic requirements for cathode-ray tubes
6214-1971 Phosphors for cathode-ray tube
6567-1972 Radiation protection for an X-ray tube in a protective tube-housing, operating between 10 kV and 400 kV
6568-1972 Implosion protection for TV picture tubes
6576-1972 Methods of measurements on gas filled cold cathode indicator tubes
6577-1972 Methods of measurements on gas filled cold cathode voltage stabilizing and voltage reference tubes
6757-1972 Dimensions for high tension cable terminations for X-ray tubes
6758-1972 Dimensions for high tension receptacles for X-ray tubes
7012-1973 Specification for X-ray tube shield

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	$1\ \mathrm{N} = 1\ \mathrm{kg.1\ m/s^2}$
Energy	joule	J	$1\ \mathrm{J} = 1\ \mathrm{N.m}$
Power	watt	W	$1\ \mathrm{W} = 1\ \mathrm{J/s}$
Flux	weber	Wb	$1\ \mathrm{Wb} = 1\ \mathrm{V.s}$
Flux density	tesla	T	$1\ \mathrm{T} = 1\ \mathrm{Wb/m^2}$
Frequency	hertz	Hz	$1\ \mathrm{Hz} = 1\ \mathrm{c/s}\ (\mathrm{s^{-1}})$
Electric conductance	siemens	S	$1\ \mathrm{S} = 1\ \mathrm{A/V}$
Pressure, stress	pascal	Pa	$1\ \mathrm{Pa} = 1\ \mathrm{N/m^2}$

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